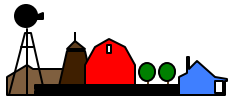
Sustainable Agriculture
In the Mid-Atlantic States

Precision Agriculture

Technical Note 3
October, 2000



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Precision Agriculture vs. Sustainable Agriculture

Precision Agriculture. Sustainable Agriculture. Are the two concepts compatible? Some see sustainable agriculture as using traditional farming techniques as well as new ideas to reduce or eliminate the chemical input in a farming program, which overall helps diversify the farm through the use of alternative crops, open pollinated crops, and crop rotations, etc., while stabilizing the economics of the operation.

There can be a sense that going sustainable involves simplifying operations, including the use of less expensive equipment so as to get back in touch with the natural cycles of the land. An example of this is an intensive grazing system where the farmer rotates livestock through carefully managed paddocks. This method reduces the need for growing large quantities of grain, as well as the equipment associated with it. It lowers input costs and may produce more net returns.

Precision agriculture, also called precision farming, prescription farming, site specific farming, or variable rate technology uses state of the art technology such as remote sensing, geographic information systems (GIS) and global positioning systems (GPS).

Precision agriculture does demand the use of specialized equipment. However, the use of high technology in precision agriculture may help meet the goals of sustainable agriculture, just from a different angle.

Benefits of Precision Agriculture

Precision agriculture uses global positioning systems (GPS) via satellites to pinpoint locations in a farm field. Knowing exact locations in a field can help track soil sample sites and compare the lab results with soil maps. It can help with applying fertilizers and pesticides specifically to fit the soil properties and soil conditions for less environmental impact. It can locate variations in the field so that tillage adjustments can be made to help reduce erosion and improve seeding operations. And it helps with tracking specific yields throughout the field.

In general, precision agriculture can potentially reduce input costs, increase yields, and reduce environmental impacts through better management.

Specifics of Precision Agriculture

Precision agriculture includes three areas: data collection, analysis and application. GPS is used to collect the data. GIS and other models are used by the farmer to analyze the data. The farmer then applies the knowledge by adjusting the application of amendments, seeding rates, irrigation amounts and location, and harvest time.

Basic Economic Issues

Computers are the foundation of precision agriculture. Crop yield monitors can be mounted on combines, roughly costing $7,000 for the monitor and GPS receiver according to the Economic Research Service (Dennis A. Shields, April 1998). They also state there's an additional $3-$7 per acre for grid soil testing. The more expensive aspects of precision agriculture can be done on a custom basis to avoid purchasing the larger components. The report estimates costs for precision agriculture in 1998 to be from $9-$23 per acre (not including time and labor to

The goal of this "Technical Note 3" is to give a brief overview of precision agriculture and how it relates to sustainable agriculture. Comments and corrections are welcome. Contact: Janet Graham, Ecological Agronomist, NRCS-IRT, 1203 College Park Dr., Suite 101, Dover, DE 19904. Tel: 302-678-4178, Fax: 302-678-0843, email: janet.graham@de.usda.gov

utilize the system), with the expectation of it getting cheaper as the technology develops.

Is Precision agriculture applicable to the smaller farming operations of the eastern United States? In the University of Maryland "AGNR 1999 Annual Report" they highlight a farmer who has been testing precision agriculture since 1995 on his farm. In 1999 they pulled the data together from over four years to adjust seeding rates of corn. The farmer was able to cut costs by reducing the number of plants in less productive areas of the fields.

Further Comments

Most resources agree that precision agriculture technology is just in its infancy. It has the potential to be another tool in the sustainable agriculture field.

Secretary of Agriculture Dan Glickman stated on June 19, 1995 during a Field Day at the USDA Agricultural Research Center in Beltsville, Maryland, "Precision agriculture will help producers cut their chemical costs. … Precision agriculture will help the environment. … Precision agriculture will help family farmers and rural America. … It is imperative that our farmers and our rural communities have the tools to play and win in increasingly competitive global markets. And it is equally imperative that these tools protect our resource base, our land, our water, our air." (Press release No. 0506.95)

The details of implementing precision agriculture hinge on using the proper equipment. This includes a planter that plants at variable rates as it goes across the field, and a fertilizer and lime spreader that spreads at variable rates. The technology is available but cost prohibitive for many at this time.

Definitions

Precision agriculture:

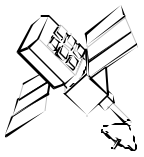
1. A term used to describe the goal of increased efficiency in the management of agriculture. (Simon Blackmore, Cranfield University)
2. Carefully tailoring soil and crop management to fit the different conditions found in each field. (Chris Johannsen, Purdue University)
3. A management strategy that employs detailed, site-specific information to precisely manage production inputs. The idea is to know the soil and crop characteristics unique to each part of the field, and to optimize the production inputs within small portions of the field. The philosophy behind precision agriculture is that production inputs (seed, fertilizer, chemicals, etc.) should be applied only as needed and where needed for the most economic production. (Stephen W. Searcy, Texas Agricultural Extension Service)
4. A management strategy that uses information technologies to bring data from multiple sources to bear on decisions associated with crop production. (The National Research Council committee)

Global Positioning Systems (GPS)

1. The GPS was developed by the USA military for accurate positioning of personnel. Selected access is allowed for over twenty satellites. A GPS receiver picks up signals from all the satellites within range and the data is processed to produce the exact position of the receiver. (C.S. Parkin, Cranfield University)

Geographical Information Systems (GIS)

1. It is a computerized mapping system that produces a series of overlays representing the spatial variability of a range of properties. GIS information can help a farmer look at the interaction between yield and pest population, and subsequently make adjustments in the operation. (C.S. Parkin, Cranfield University)



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